

Spillover of European unconventional monetary policy to the trader partners of euro area: A GVAR approach

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Disclosure statement:

Authors are not aware of any findings that might be perceived as affecting the objectivity of this study

Conflicts of interest:

The authors reports no conflicts of interest.

Cite this article

Ouerghi, F., & Chedly, A. (2021). Spillover of European unconventional monetary policy to the trader partners of euro area: A GVAR approach. *International Journal of Accounting, Finance, Auditing, Management and Economics*, 2(1), 56-74.
<https://doi.org/10.5281/zenodo.4474487>

DOI: 10.5281/zenodo.4474487

Published online: January 29, 2021

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Spillover of European Unconventional Monetary Policy to the trader partners of Euro Area: A GVAR approach

Abstract:

We focus in this paper on the spillover effects of Unconventional Monetary Policy (UMP) of European Central Bank (ECB) on economic partners of the Euro Area. One of the main motivations of our analysis is that, while several papers have investigated the domestic and international impact of the UMP of the US and Japan there are comparatively less papers about the ECB's monetary policies and their spillover. The use of UMP by ECB has an important effect on the monetary policy of the Euro Area and regarding the strong trade and financial linkages between the Euro Area and neighboring countries, an analysis of spillover is then highly relevant.

This study considers several countries who are excluded from previous analysis like Tunisia and Turkey. The main purpose is to provide a comparative analysis of the spillover impact of these policies from a group of countries to another. To do this, we use a multi-country dataset to set up a Global-VAR (GVAR) model. Our results validate the transmission from the Euro Area toward its trade partners whatever the degree of their financial openness was. We note the heterogeneity of the response from an economy to another.

Key words: Unconventional Monetary Policy, Global Crisis, Euro Area, Spillover Effects.

JEL Classification: E52; F42; G21

Paper type: Empirical research

1. Introduction

Since the global financial crisis of 2007-2008, the central banks of main developed economies has preferred to maintain their interest rates at the lowest level and undertook new mechanisms of monetary policy such as quantitative easing (QE), forward guidance or large-scale asset purchases. The aim of this unconventional monetary policy is to maintain economic and financial stability. The result of this policy concern not only financial stability and economic relaunch at national level, but also the spillover of QE to other emerging and developing economies. We specially observe its effects on exchange rates and foreign interest rates, greater than those of conventional monetary policy. Other effects are observed, such as a global asset allocation or currency mismatches in emerging countries as they hold a large local currency assets and a large foreign currency liabilities, or effects on domestic capital markets caused by cross-border capital flows.

Recently a large literature is developed on the potential international spillover effects of unconventional monetary policy (UMP) carried out by central banks of the largest developed economies, especially those undertaken by the Federal Reserve and European Central Bank. A large number of studies focused on Fed's UMP showing that Fed's quantitative easing is characterized by a spillover effect on other economies' asset prices, exchange rates and capital flows (McCauley et al. 2015, Georgiadis 2015, Aizenman et al. 2016, Bhattarai et al. 2015 and Fratzscher et al. 2013).

A number of papers examine the effects of European Central Bank's UMP, most of them argue the existence of an effect on macroeconomic variables and financial assets in Euro Area countries (Abbasi and Linzert 2012, Peersman 2012, Ghysels et al. 2013, Andrade et al. 2016 and Gambetti et Musso 2017). Other studies discuss the price effects and outputs effects of the European Central Bank's UMP on advanced and emerging economies (Fratzscher et al. 2014, Falagiarda et al. 2015, Georgiadis and Grab 2015, Potjagailo 2016).

Most studies of the spillover effects of ECB's UMP are interested only to European countries, however, there is a lack of studies regarding the spillover effects of ECB's UMP to small advanced open economies outside Europe (Bernhard and Ebner 2016, Bluwstein and Canova 2016). Regarding the strong trade and financial linkages between the Euro Area and neighboring countries, an analysis of spillover effects is then highly relevant.

Our contribution in this paper is the study of the spillover effects of UMP of ECB on economic partners of the Euro Area, namely South Mediterranean countries. We consider several countries who are excluded from previous analysis like Tunisia and Turkey. The main purpose is to provide a comparative analysis of the spillover impact of these policies from a group of countries to another. To do this, we use a multi-country dataset to set up a Global-VAR (GVAR) model, which is developed by (Pesaran, Schuermann, and Weiner 2004) and allows examining the propagation of shocks through macroeconomic linkages between countries.

The rest of the paper is organized as follows. A literature review is presented in section 2. Section 3 outlines empirical study. Section 4 reports dynamic analysis an interpretation of the results, and Section 5 concludes.

2 Literature Review

In the literature, three potential channels through which spillovers can occur at interest rates in an originator country to other countries. The first one is *domestic macroeconomic conditions*. Monetary policy announcements about UMP in the originator country can reveal additional information about economic conditions in that country, leading investors to modify their expectations in recipient countries (Campbell et al., 2012 and Nakamura et Steinsson, 2018) given the economic linkage between the two countries. Such linkage may create co-movements in business cycles (Kose et al., 2003 and Baxter and Kouparitsas, 2005) or inflation dynamics

(Ciccarelli and Mojon, 2010 and Neely and Rapach, 2011). The second channel is *the exchange rate*. If the exchange rate in a country is pegged to that of a larger economy, and if it has an open capital account, it will need to maintain interest rates close to those of the larger economies in order avoid large capital outflows (Shambaugh, 2004). The third channel is *Bond risk premiums and financial conditions*. In financially integrated world, the variation in terms premiums in a large country lead to the same variation in other countries. This due to portfolio rebalancing of international investors that invest in several countries, seeking higher yielding assets (Bruno and Shin, 2015; and Malamud and Schrimpf, 2018).

The intensity of these spillovers depends on the degree of financial integration between the economies. For this reason, there is no consensus on how UMP impact other countries, it is depends on the sample used. We distinguish studies of transmission of UMP to emerging countries and transmission of UMP to developed countries.

Some studies focus on the case of emerging countries; they prove that the Quantitative Easing and the other UMP stimulate quick movement of capital inflows, an appreciation of the exchange rate of the emergent economies, an increase of equity price and an increase of Credit Bank in this region. This is the case for Punzi and Chantapacdepong (2017), they evaluate the impact of the monetary policy of the United States on the Asia-Pacific region, they argue that emerging economies' central banks react to the shocks impulse by diminishing their interest rate. This validates the dilemma between autonomous monetary policy and the capital control (Rey 2015). This dilemma concerns the emergent economies who have to face the spillover of UMP's of advanced economies. In the case of Chinese and Brazilian economies in 2010 and 2011 period, Chen et al. (2015) show the importance of the spillover effects of UMP in stimulating their respective recoveries in 2009 and 2012.

For Japan's UMP, Ganelli and Tawk (2016) evaluate the transmission to other Asian economies using global VAR model. Based on real GDP, inflation, equity price, exchange rates, short-term interest rates, credit banks, capital inflow and oil price, and using a sample of 12 economies from ASEAN and partners of Japan, they prove a significant and positive spillover except for the domestic exchange rate against the Yen.

In the case of European UMP, Potjagailo (2016) evaluates the transmission effect of Euro Area's monetary policy on 13 economies of European Union outside the Euro Area. The author uses a large set of variables covering real activity, financial and prices variables. The results show that an expansionary monetary policy shock in Euro Area raises production in the majority of non-Euro area countries. The effect is more important in small open economies with fixed exchange rate regimes. Furthermore, expansionary monetary policy in Euro Area leads to drop in interest rates in several non-Euro area countries. This effect is more significant in economies with floating exchange rate regimes, with a high degree of financial integration and a high degree of risk taking. The author notes the heterogeneity of response from a country to another on prices. Horváth and Voslarova (2016) and Gambacorta et al. (2014) argue an increase in economic activity and an increase in inflation caused by the interest rate policy. The spillover affects the inflation and the GDP growth, which increased during the first six months after the implementation of the unconventional monetary policy. Analysing the case of six countries belonging to the European Union but outside the Euro Area, Babecka Kuchacukova et al. (2016) prove the existence of an impact of monetary policy outside the Euro Area countries. However, this impact is heterogeneous from a country to another and from a policy to another. UMP affects products and inflation in the same way inside and outside the Euro Area. The unconventional monetary shock has a weaker impact than those from conventional monetary policies. For Fratzscher et al. (2013), the policies followed by emerging countries to limit the impact of the spillover effects was inefficient.

Another range of studies focus on the transmission of UMP too advanced and emerging countries. Fratzscher, Lo Duca and Straub (2013) examine the transmission of Quantitative Easing of the Fed to 65 countries divided in two subsamples: advanced countries and emergent

countries. They find that for Quantitative Easing (QE1) applied during 2008-2009, UMP leads to a portfolio relocation, an appreciation of the US dollar, a decrease of bond yield and it allows sustaining the financial market. For the second measure (QE2), launched in 2010, authors prove a negative effect through a capital outflow and a depreciation of the US dollar. Georgiadis (2015) studies the transmission of monetary policy of the Fed on the 1999-2009 period on a sample of 61 economies. He concludes that the transmission of UMP is important for all countries at different degrees. The results show that policymakers could moderate their economies' weaknesses to the transmission of the US unconventional monetary policy by improving trade integration and financial market integration, increasing the flexibility of exchange rates and reducing frictions in labour markets. For Chen et al. (2015), the UMP reduces the spread of corporate bonds, can prevent episodes of prolonged collapse and inflation in the developed economies. The effects of emerging economies are heterogeneous but globally more important than the effects found for advanced economies.

Japan was the first economy who used the unconventional monetary policy on a large scale.

Following Mauro and Pesaran (2013), Dekle and Hamada (2015) analyse the transmission of monetary policy of Japan on a sample of 25 economic partners. They find that an expansionary monetary policy impulse the depreciation of yen, the increase of asset price, with a positive impact on the Japanese GDP. The authors note that an expansionary monetary policy negatively affects the GDP of the United States, at short and long term. This policy tends to have a positive impact on the GDP of economic partner of Japan, in particular the small economies. The main exception of this result was China which validated the theory of the vulnerability of the small economy which is the most likely to undergo monetary policy. On a sample of 28 countries of the European Union and The United States, Hájek and Horváth (2015) use the production industrial index, the inflation, the exchange rate the state bonds yield, and they use the oil price as a global variable, to analyse the transmission effects of European UMP. They divide the sample in three groups: Central European economies, Southern European Economies and the advanced economies, they find that the central European economies tend to react more strongly than the southern European economies. This result can be explained by the intensity of the trade relationship between West Europe and the Central European.

Based on this body of literature, our paper seeks to study the spillover effect of ECB's UMP based on several variables: risk-taking channel of monetary policy, as made by Adrian and Shin (2010), Borio and Zhu (2012). We also consider exchange rates and capital flows, following McCauley et al. 2015, Georgiadis 2015, Aizenman et al. 2016, Bhattarai et al., 2015 and Fratzscher et al. 2013. Based on other contributions we include interest rate (Gilchrist et al., 2014 and Andersen et al., 2007). We consider GDP and inflation as Fratzscher et al. (2014), Falagiarda et al. (2015), Georgiadis and Grab (2015) and Potjagailo (2016).

3. Empirical study

3.1 Sample

In this study, we analyse the spillover effects of ECB's UMP to European countries and to peripheral countries. We also include the United States of America to reflect their dominant role in the global economy. The choice of European countries is to cover the considerable gaps in the literature, few studies focus on the transmission of UMP of ECB in the region and no study consider the peripheral ones.

Our sample set cover 18 economies, 16 of them are divided in 4 subgroups based on their financial integration and their relation with the Euro Area. We use these subgroups to make comparison of the effect of Euro Area unconventional monetary policy shocks. We also consider the Euro Area like as one economic entity.

The group 1 include countries, who are members of the European Union but are outside the Euro Area: United Kingdom, Denmark, Sweden, Poland, Czech Republic, Hungary, Romania and Bulgaria,

The group 2 include the countries outside the European Union but having privileged partnership: Norway and Switzerland,

Group 3 include countries that have applied to the European Union and have adopted certain European standards: Iceland, Turkey and Serbia,

Group 4 include our contribution by integrating the peripheral countries of the Euro zone: Tunisia, Morocco and Israel

3.2 Data and Variables

Our dataset consists of monthly data from January 2008 to December 2015. We choose this period to cover the beginning of the implementation of the unconventional monetary policy by the ECB.

The following country-specific variables are used for the GVAR model: real GDP, CPI, inflation, bank credit, the short-term interest rate, the monetary base, the direct foreign investment and capital inflows, available on the IMF database. We also use the oil price as a global variable. We also use the bilateral exchange rate vis-à-vis the euro from the database OANDA and the bilateral effective exchange rate from the database of the BIS for the United States and the Euro Area (see Table 1). We used the MSCI index for the Equity price¹.

Finally, we use the census X13 from *EViews* to solve the seasonality issue and we also use the method of Chow and Lin (1971) to interpolate the annual data to monthly frequency.

3.3 Global-VAR

The global-VAR approach can be specified in two steps; the first one is the estimation of the country-specific model based on the rest of the world. In this model, we use domestic variables and weighted average sectional foreign variables, these variables are qualified as “Star variables” and supposed to be weakly exogenous. In the second step, the individual VARX* models are simultaneously estimated as a global VAR at a big dimension. This step allows as limiting all scenarios chocks.

The GVAR model is based on a set of VARX* individual models. We suppose a number N of countries, $i = 0, 1, \dots, N$, where $i=0$ is the country reference (or the central country). Each country has t domestic variables, $t=1, 2, \dots, t$.

We consider:

$$x_{it}^* = \sum_{j=0}^N w_{ij} x_{jt}, \text{ where } w_{ii} = 0$$

With $\begin{cases} x_{i,t} = k_i \times 1, \text{ vector of domestic variables} \\ x_{i,t}^* = k_i^* \times 1, \text{ vector of foreign variables} \\ w_{i,j}, j = 0, 1 \dots N \text{ where } \sum_{j=0}^N w_{ij} = 1 \end{cases}$

$w_{i,j}$ is the weight representing the relation between a country i and the rest of the partners.

Table 1 : Variables Description

Variable	Description
<i>Real GDP (y)</i>	$y = \ln(GDP_{it})$
<i>CPI Inflation (dp)</i>	$dp = \ln(CPI_{it}) - \ln(CPI_{i,t-1})$

¹ The dataset for equity prices is not available for Iceland.

Equity price (eq)	$eq = \ln \frac{EQ_{it}}{CPI_{it}}$
Exchange rate (ex)	$ex = \ln \frac{E_{it}}{CPI_{it}}$
Monetary Base (mb)	Monetary Base as a percentage
Short-run interest rate (r)	$r = 0.25 * \ln (1 + R_{it}^s/100)$
Bank Credit (bc)	$bc = \ln \frac{BC_{it}}{CPI_{it}}$
Oil price (lnpoil)	$\ln Poil$
Kapital Inflows (ci)	$ci = \ln (\frac{CI}{CPI_{it}})$

Source: Authors

4. Dynamic Analysis

To study the impact of BCE unconventional monetary policy on the other economies of our sample, we have first to distinguish different kinds of this policy.

4.1 shocks Identification

We use as reference the shocks used by (Peersman 2011) and we added shocks elaborate by Ganelli and Tawk (2016). Peersman (2011) focuses on *quantitative easing* measures, who has to provide liquidity to the banking sector to boost the economy; he classifies these measures in three categories:

- 1) Credit multiplier shocks
- 2) Interest rate innovations
- 3) Non-Standard policy actions

These shocks are characterized by an increase of the credit bank and a decrease of the interest rate. Therefore, based on this work, we identify two shocks: a negative shock of interest rate and a positive shock in credit banking. Based on the study of Ganelli and Tawk (2016), we identify another chock that is the result of the monetary easing policy: a decline in the interest rate and the increase in bank loans leading to an increase of the asset price.

Table 2: Nature of shock

Variables	Nature of shock
Short term interest rate	Negative Shock
Credit Bank	Positive Shock
Price of Assets	Positive Shock

Source: Authors

4.2 Structural Impulse Response

We place the Euro Area model as the first country-bloc in the GVAR to look at the impact of the ECB unconventional monetary policy.

4.2.1 short term interest rate shock

First, we study the impact of a decrease of interest rates; this shock corresponds to a decrease of 100 bp of monthly interest rates (figure 1).

In the case of the Euro Area, the negative shock is followed by a decrease of the real GDP, which goes from a 0.078% to -0.1% for 40 next month. However, the inflation react positively

to the shock with a peak around +0.03%, this rise is not persistent after the first six months, the response stabilized around 0.02% for the long and the short run.

The shock impulse an exchange rate depreciation for the last two years, which comply with the literature about the impact of the UMP's. This depreciation indicates that the decrease of the short-term interest rate is important, this result is opposite to the case of Japan (Ganelli and Tawk, 2016)

The bank Credit shocks are a weak with negative response. We also notice that the decrease in interest rates lead to an increase in capital outflows by 1%. The ECB interest rate didn't allow to stimulate economic activity or the bank credit to impulse an economic recovery, these results are in accordance with those of Cecioni et al. (2011), Fawley and Neely (2013), and Peersman (2011)

For the real GDP (y), we notice for the group 1 similar response to the Euro Area, the real GDP of group 2 present a peak around 0.1%. For the group 3, the response is weaker than for the groups 1 and 2 ; it is between -0.01% and 0% for all period. For the group 4, the response is negative, around -0.1% from the first semester. These responses are close to that of the Euro Area and confirm that the negative shock does not have significant impact on the economic activity.

For the inflation (dp), group 1 and 2 have the same responses, peaks between -0.01% and 0.01%. These results are confirmed by (Gambacorta et al., 2014; Horváth and Voslarova, 2016; Peersman, 2011). Groups 3 and 4 present similar response; an important fall of the inflation before a stabilization for group 3 around 0.05% and 0.01% for group 4.

For the exchange rate, we note an appreciation for the group 1 who reach 0.5% at short-term, the group 2 present depreciation around -0.25%, the group 3 present an appreciation and finally depreciation for the group 4. These results are confirmed by the scientific literature for the group 1 and 3, the depreciation of Euro Area impulse an appreciation for the other currency in the case of group 2, we suppose that depreciation of Euro is not relevant to the impulse an appreciation for these currencies. For the group 4, we have an unexpected response.

For the equity price (eq), the group 1 present a similar response to the Euro Area, a sudden fall of prices around -2%, the group 2 present also a decrease of equity price, for the group 3 the fall of price is around -3% which present the most important decrease, the response of group 4 are around -1%.

For the bank credit, the group 1 present a response between 0% and 0.2%, which indicate that the rate declines impulse slightly the granting of the loan. However, the response of group 2, 3 and 4 are weak around -0.005%. The most likely hypothesis is the insignificance of this shock.

For the capital inflows, the response of group 2, 3 and 4 are confirmed by the literature, a decrease of the short-term interest rates impulse a rise of capital on peripheral economies. For the group 1, the response is included between -0.05% and 0% which can be explained by the fact that investors are looking for more higher returns even if it involves more risk, (Pfister and Valla, 2015).

The United States present a similar response to the Euro Area for the real GDP, the response of inflation is around -0.02%, a decline of equity price around -1%, slight increase of bank credit included between 0% and 0.05% and finally a decline of capital inflows.

4.2.2 Bank credit shock

We present the results of a positive shock to Euro Area Credit Bank. This shock lead to a rise around 1%. The bank credit shock corresponds to the literature of the main channel of the transmission of Unconventional Monetary Policy as this policy has as principle objective to stimulate the granting of the loan (figure 2).

Regarding the domestic impact of this shock, it positively stimulates economic activity, we note the presence of a peak of the real GDP but the global impact on GDP was linked to the first semester who picked up to 0.1%.

We note an unstable response at short-term for the inflation, between -0.04% and -0.06%, followed by a peak around 0%. The Euro Area is impacted by depreciation around 0.06% during the first semester before a stabilization around -0.4%.

The equity price slightly fall to -1% before reaching -5% and finally for the capital inflows, the decrease reach -0.2% at short-term before stabilization around 0,1% for the rest of periods.

For the groups 1 and 2, the impact on real GDP at short-term is similar to that of the Euro Area. The response of group 3 presents a weaker peak around -0.2%. Finally, the response for the group 4 is a peak at short-term around 0.05%.

Effects on inflation were less homogeneous, however, we note that the response is weaker, the response of group 1 is a peak in the first month, who reaches 0.01%, the response of group 2, we note some fluctuations at short-time and included between -0.04% and 0%.

The response of group 3, we noted the fall of inflation to -0.1% and a peak around -0.025% and finally for the group 4 response is a decrease around -0.02%. These results are closer to those of Jordan (2016), where central banks of peripheral countries who take measure to contain the impact of the Unconventional Monetary Policy. The difference in reactions between inflation and GDP are similar to the finding of Peersman (2011) and Gambacorta and al. (2014).

For the exchange rate, we note for the group 1, an appreciation around 0.2%, the response for the group 2 is also an appreciation between 0.1% and 0.2% at short and long term. We note a quick appreciation around 0.3% for the group 3, and finally for the group 4, we reveal depreciation between -0.3% and -0.2%. The results of the first three groups corroborate with literature: an appreciation of the currencies.

The depreciation of the group 4 is related to the result found by Horváth and Voslarova (2016), who recognise insignificant depreciation on the economy adopting a fixed exchange rate regime. The depreciation of the group 4 are more important and similar to the depreciation of the Euro Is. We can explain this depreciation by the fixed regime of countries of the group 4.

For the equity price, the reaction of the first group are similar to that of the Euro Area: a sharp decrease by -5% and stabilization around -4% at the medium term. Group 4 present also a decrease but less important, around -1.5% and stabilization around -1%. These results are explained by a different level of financial integration between subgroups, and then the first three groups are highly integrated and are heavily impacted by the ECB's monetary policy.

For the Bank Credit, the impact of a positive shock is highly heterogeneous, for the group 1, the response is an increase in the amount of credit provided and the response is stabilization around 0.4% at the medium term. Group 3 present a temporary response. The reaction of group 4 is an increase around 0.1% in the short term.

For the Capital inflows, we observe a response between -0.5% and 0% for the group 1. The response of group 2 is an increase of capital inflows at short term around 0.5%, for the group 3 the response is negative in the short term, around -0.5% and for the group 4 it is around 0.5% at the long term.

For the United States, a peak of 0.1% is detected for the first six months for the real GDP and stabilization around -0.1% for the rest of the period; this response is similar to that of group 1. The inflation is less stable at short term, but negative at the long term, the response is stable around -0.02% for the rest of the period. The reaction of the price asset is negative, around -1%; for the capital inflow, we note a positive response around 0.05% however, they register a decrease around -0.1% for the rest of the period.

4.2.3 Asset price shock

Figure 3 shows the responses of a positive standard deviation shock to Euro Area's. This Shock does not represent a characteristic of monetary policy tool but the impact of the spillover of the unconventional monetary policy. This shock is studied by Ganelli and Tawk (2016) for the case of Japan. We have incorporated this shock in our analysis, given the similarity between the monetary policy of Japan and the ECB monetary policy; the rise of equity prices is the main objective of the unconventional monetary policy.

The Euro Area show weaker responses than those obtained by Ganelli and Tawk (2016) in Japan. Regarding, the domestic impact of ECB's unconventional monetary policy, our result suggests that impact is weaker than those obtained by Ganelli and Tawk (2016) for the Japanese Monetary policy, an increase of equity prices stimulates the real GDP and generate a peak 0.04% at a short time for inflation, followed by a stabilization around 0.015%. We note a response around 0.2% that stabilizes around 0.1% at the long term, the level of bank credit decrease around 0.1% and the capital inflows increase around 0.2%. However, like the Japanese case, this shock impulse heterogeneous response to the economic partner of the Euro Area.

For the real GDP, our results show a similar response to groups 1 and 2, around 0.1%, the response of group 3 is around 0.4% and for the group 4 the response is extremely weak.

For the inflation, the groups 1 and 2 present pics around 0.02% of the short term and the response stabilizes around 0.01%. For the group 3, the response is more important, around 0.06% at the short term before it stabilizes around 0.04% at the long term. Finally, the shock impulses a decline of the inflation before stabilization around 0.02%.

For the exchange rate, the response of the groups 1 and 4 is weak but significant, the response of the group 1 is depreciation around -0.2% and the response of the group 4 is an appreciation around 0.1%, this result is similar to the response of the Euro Area. The response of the groups 2 and 3 are negative, we note depreciation around -0.1%.

For the equity prices and for the groups 1 and 2, the responses are similar: a brutal decrease followed by a stabilization around 2.5% of the long term. The response of the group 3 is stabilised around 2% and for the group 4 around 1%.

For the credit bank, the responses of groups 1, 2, 3 and 4 are not significant which is in line with the results founded by Ganelli and Tawk (2016), an improvement of the economic conditions and an increase in equity prices can impulse a change in the portfolio composition.

For the capital inflow, the response of group 1 is a peak between 0% and 0.1%, the response of group 2 is between -0.4% and 0%, the response of the group 3 is a peak at the short term around 0.4% before stabilization and the response of group 4 is between -0.1% and 0%.

For the United States, we note a decrease of the GDP a peak of 0.1% in the long term, for the inflation we note a peak around 0.03% and the response stabilizes around 0.01%. The response of the equity prices is around 1% and for the capital inflows the response is -0.1 at the short term and 0% at the long term.

5. Discussion

First, the analysis of these three shocks validate the existence of a unconventional monetary policy transmission for the 4 groups which is consistent with the work of (Babecka Kuchacukova et al., 2016; Dovern et al., 2015; Hájek and Horváth, 2015; Horváth and Voslarova, 2016; Potjagailo, 2016). We also note that the response of the group 1 (United Kingdom, Denmark, Sweden, Poland, Czech Republic, Hungary, Romania and Bulgaria) and the group 2 (Norway and Switzerland) are similar to those found in the Euro Area. What explains the existence of a direct transmission between the Euro Area and the economies of these groups; which corresponds to the findings of Rey (2015) and Jordan (2016). The response of group 3 (Turkey, Serbia and Iceland) and group 4 (Tunisia, Morocco, Israel) are globally more heterogeneous. It is similar for results of studies conducted for the case of U.S's UMP transmission; they also show that the impact of U.S monetary policy is not uniform across

countries. Caceres et al. (2016) focus on the effects of the U.S. monetary policy normalization on global interest rates. They prove a significant correlation between the U.S. monetary policy and domestic short-term interest rates in other countries. Nevertheless, they also confirm the existence of monetary policy autonomy in some countries, this signifies that the impact of monetary policy normalization in the U.S. is not the same across countries. Bowman et al. (2014) also analyze the transmission effects of the U.S. unconventional monetary policy on stock prices, government bond yields, and foreign exchange rates in emerging market economies. Their results are significant, especially for yields on bonds denominated in local currencies; but the degree and persistence of the impact differ across countries but depends on characteristics of each of them. Mishra et al. (2014) study the role of country characteristics on the magnitude impact of UMP. They find that countries experiencing the minimum loss in their currency's value and the lowest increase of their government bond yields; are those characterized by deeper financial markets, tighter macro-prudential policy stances and stronger macroeconomic fundamentals.

One of our main findings is about the real GDP and Inflation. The difference of amplitude between the two variables and the fact that the interest rate and credit bank shocks present a peak between the 4th and 6th month confirm the findings of the Peersman (2011), Gambacorta et al. (2014), and Horváth and Voslarova (2016). These responses are similar to those found in the Euro Area, which validates the existence of a direct transmission from the Euro Area to groups 1 and 2. Our results corroborate with those of Gambacorta et al. (2014) highlighting the non-persistent nature of the effects of unconventional policies on the real economy, since the response of the two variables didn't boost the economy. Gambetti and Musso (2017) demonstrated that, ECB'UMP have had a significant and positive effect on real GDP and inflation during the first 2 years after the shock. Conti et al. (2017) and Boeckx et al. (2017) reveal that the ECB's UMP has contributed to an increase in economic activity and inflation since 2014.

For local currency of the countries composing groups 1, 2 and 3, we note an appreciation vis-à-vis the Euro for the interest rate and credit bank shocks, these results confirm the those founded by Potjagailo (2016), Dekle and Hamada (2014), Punzi and Chantapacdepong (2017), and Neely (2014). However, for the equity price shock, we note a divergence with the finding of Ganelli and Tawk (2016), namely an appreciation of the euro instead depreciation.

Finally, we note depreciation for all domestic currencies except of those of groups 4. This reaction can be explained by the composition of the group, the three economies composing this group have administered their exchange rate, which confirms the results of Horváth and Voslarova (2016), showing that in the European economies who adopt an administrated exchange rate regime, domestic currencies depreciate as the Euro do. Our results are contradictory with those find by Glick and Leduc (2012), Punzi, and Chantapacdepong (2019) for the case US UMP. Their results indicate that external monetary shocks create an upward pressure on national currency in the recipient countries; the UMP in the US leads to an appreciation of currency's value in Asian developing countries. Tran and Pham (2020) find that UMP shocks from the US lead to an appreciation of local currencies, MP shocks seem to exert adverse effects.

We note the existence of significant differences in the transmissions of shocks in the asset prices as well as the economies of group 1, 2 and 3 present similar reactions to the Euro Area, while the group 4 react with a weaker amplitude, which can be explained by the weak financial integration of some economies composing these groups. This result corroborates with the work of Potjagailo (2016).

Regarding the credit bank, only its increase seems to have a positive impact which is in line with the work of Punzi and Chantapacdepong (2017), indeed we note an increase in the volume of credit banks in the euro area which has a positive impact on all other countries.

The capital inflows present heterogeneous responses from a shock to another, these results are for the interest rate and credit bank shocks similar to those founded by Fratzscher et al. (2013) for the case of monetary policy of the United States. Indeed, depending on the kind of monetary policy applied, a massive capital inflows followed by a capital outflow can happen. These results confirm those of Bhattarai et al. (2015), the impact of monetary policy depends on capital flows, a more integrated country undergoes more transmission effect.

For group 1 and , the results are close to those of the Euro Area, and they confirm the work of Rey (2015) and Jordan (2016) which argues that little economies suffer the impact of monetary policies of the important economies through financial integration. The result is mitigated and heterogeneous for countries of groups 3 and 4, presenting an impact of monetary policy transmission.

Our results prove the spillover effects of ECB's UMP, hence the liquidity shocks from the ECB tend to influence developed countries relatively more strongly than developing markets.

6- Conclusion

This paper analyses spillover from ECB unconventional monetary policy on the trade partner of Euro Area. We used the GVAR model, which captures the financial and economic linkages of economies across trade and financial channels. We combined financial and trade in order to build weights of country linkage, then we studied spillover through bilateral trade channel and foreign direct investment channel.

The countries of our sample are related to the Euro Area by trade and financial channel. According to their relation with the Euro Area, we distinguish four subgroups, the economies of Euro Area but outside the EU, the economies who have a partnership with the U.E, the economies having a procedure for accession to the Union and the other economic partners' particularly southern Mediterranean countries.

Based on the papers of Peersman (2011) and Ganelli and Tawk (2016), we defined three types of shocks ;

- i) Negative interest rate shock of the Euro Area
- ii) Positive bank credit shock of the Euro Area
- iii) Positive equity prices shock of the Euro Area

The first two shocks are characteristics of an unconventional monetary policy of Euro Area but the third one is a consequence of the UMP.

Our results validate the existence of a transmission from the Euro Area toward its trade partners whatever the degree of their financial openness is. We note the heterogeneity of the response from an economy to another.

The UMP's generates an appreciation vis-à-vis euro except for countries who have fixed exchange regime. We note the negative impact of the UMP on equity prices and divergent effect on capital inflows.

We also conclude that the interest rate, even if it does not boost the economy, it has a spillover impact. For the credit bank, we note an important impact on the trade partners of the Euro Area.

However, the results also indicated some differences in the persistence of the monetary policy effects, depending on characteristics of economies.

Our results show that the ECB's UMP lead to an appreciation of domestic currencies in Europe, this might reduce the competitiveness of developing countries in terms of export volume. We suggest that this situation can be the source of financial vulnerability in the recipient countries. The results show that policymakers could moderate their economies' weaknesses to the transmission of the ECB' UMP through enhancing trade and financial integration, and by supporting the flexibility of exchange rates.

Figure 1: negative chock of Interest rate

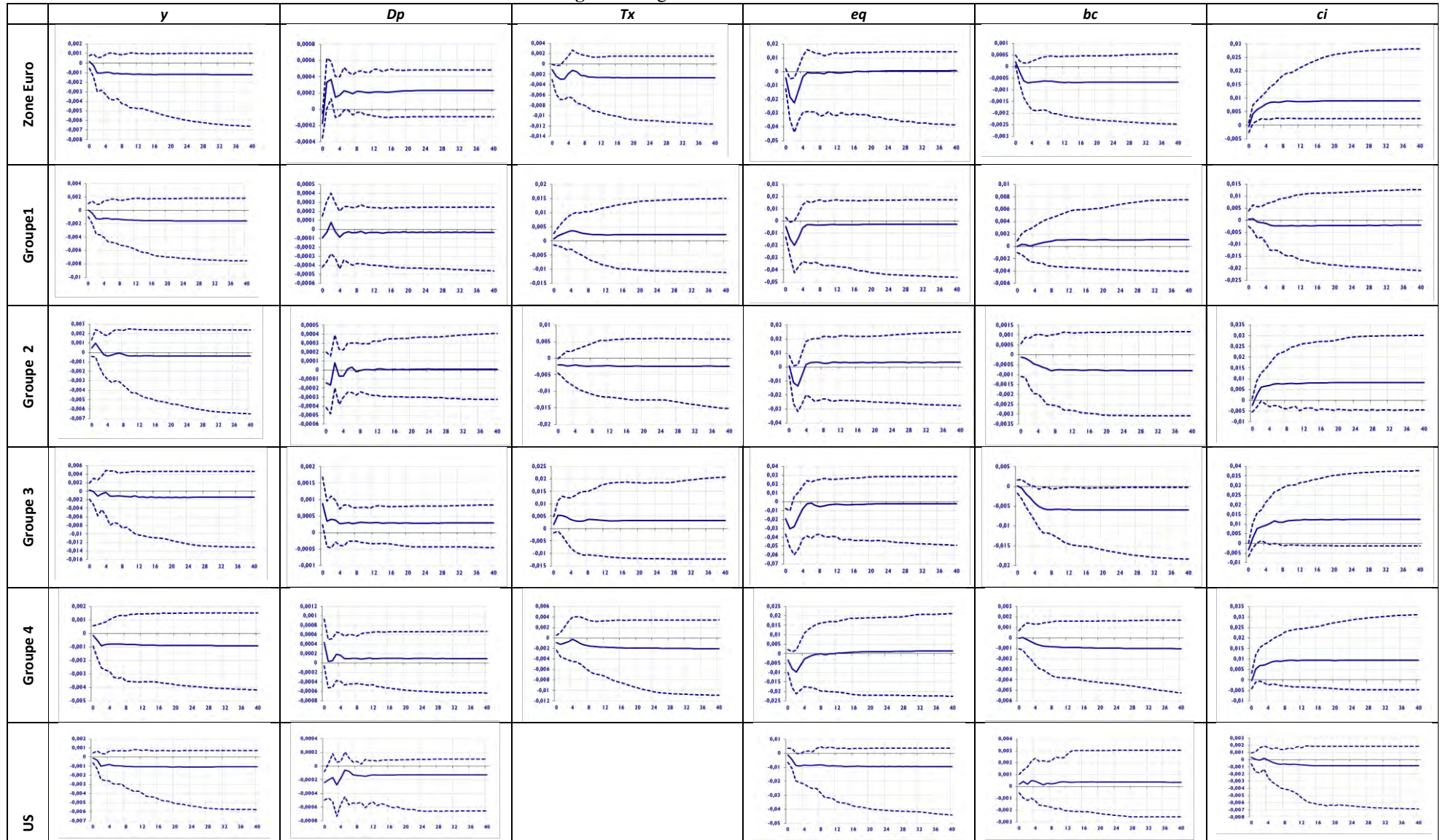


Figure 2 : A positive shock of bank credit

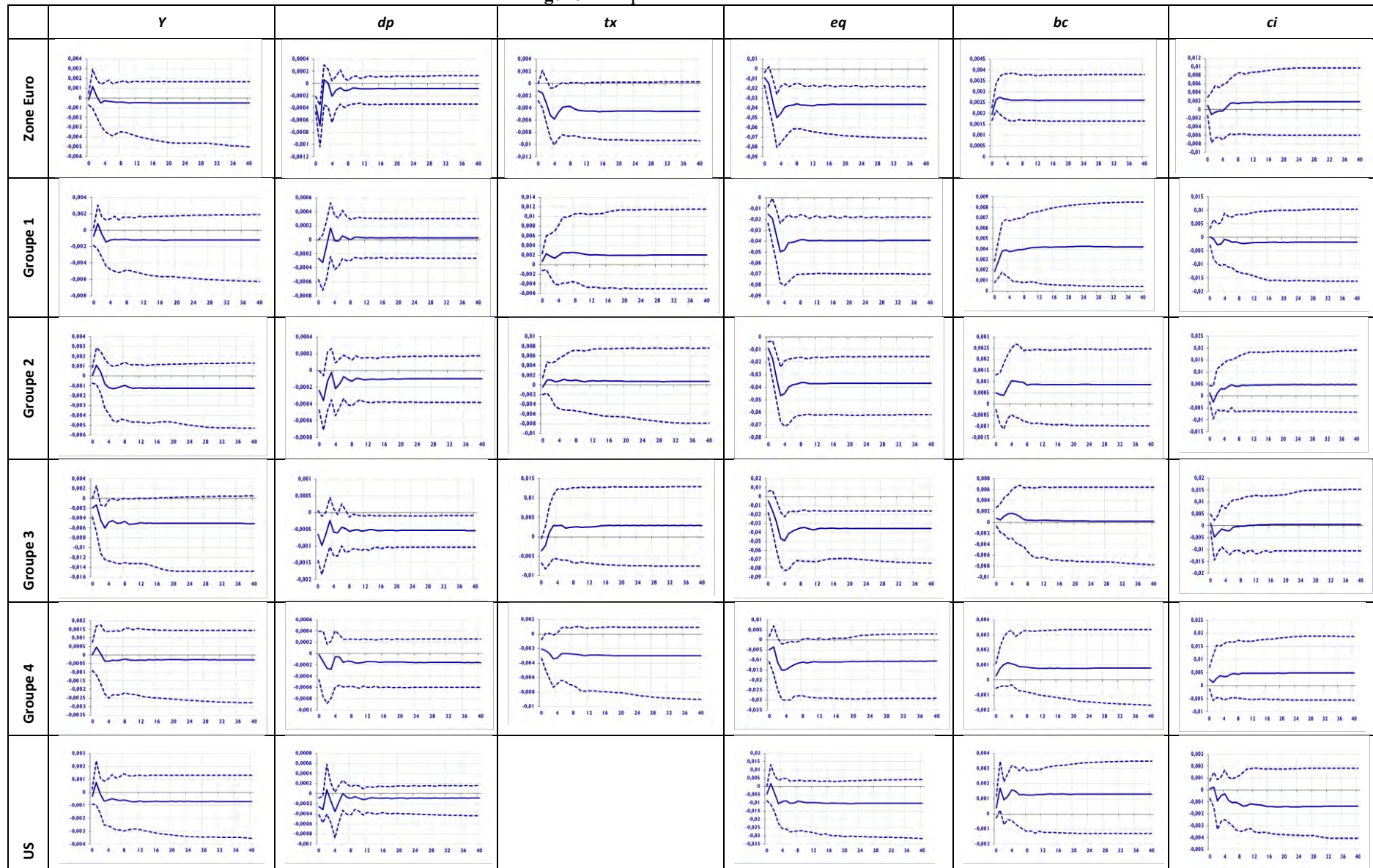
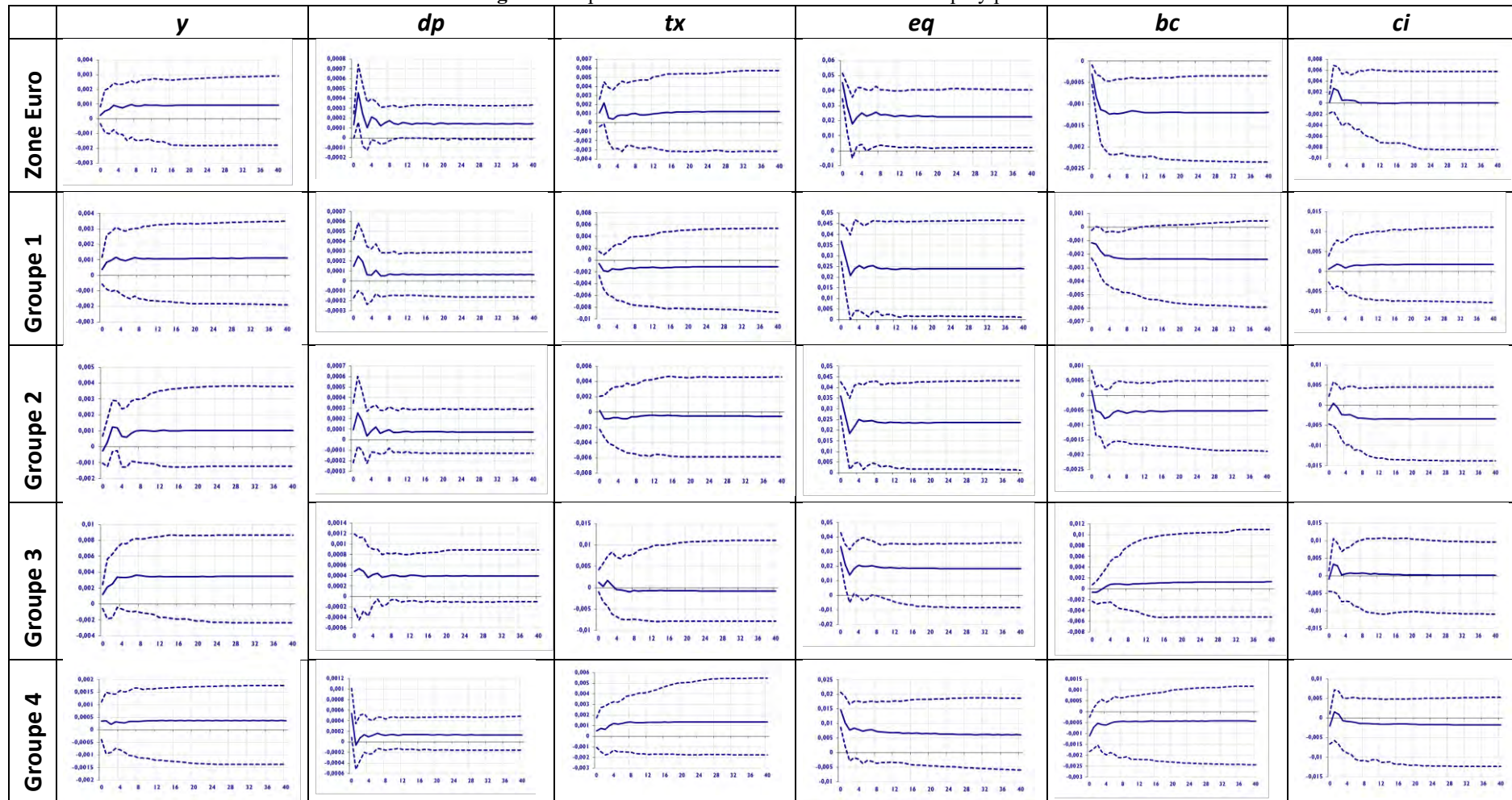
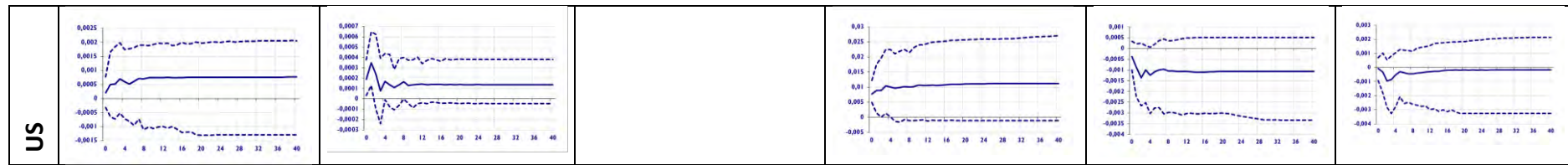


Figure 3: A positive deviation shock to Euro Area's equity prices





Source: Authors

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